

Preliminary Analysis of Science Operations

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Contributions - Past

- **Finished Analysis of Grey Mountain, AZ field test**
 - **Geologists analyzed site through mock rover, then visited the site.**
 - **Results indicate experience with rover geology is an important factor**
 - **Analyzed transcripts to understand geologist strategies and behaviors**
 - **Errors attributed to both geologist experience and rover technology with roughly equal frequency.**

Current Contributions

•Analyzing the Science Operations for the 2004 Life in the Atacama Field Test

Zoë



Mechanical Characteristics

	Zoë	FIDO	Spirit/ Opportunity
Length	200 cm	100 cm	160 cm
Width	180 cm	80 cm	230 cm
Rover	150 cm	50 cm	50 cm
Height			
Mass	180 kg	60 kg	174 kg
Velocity	100 cm/s	< 9 cm/s	5 cm/s

LITA Mission Paradigm

Operational Hypothesis

- Planetary astrobiology requires extensive mobility

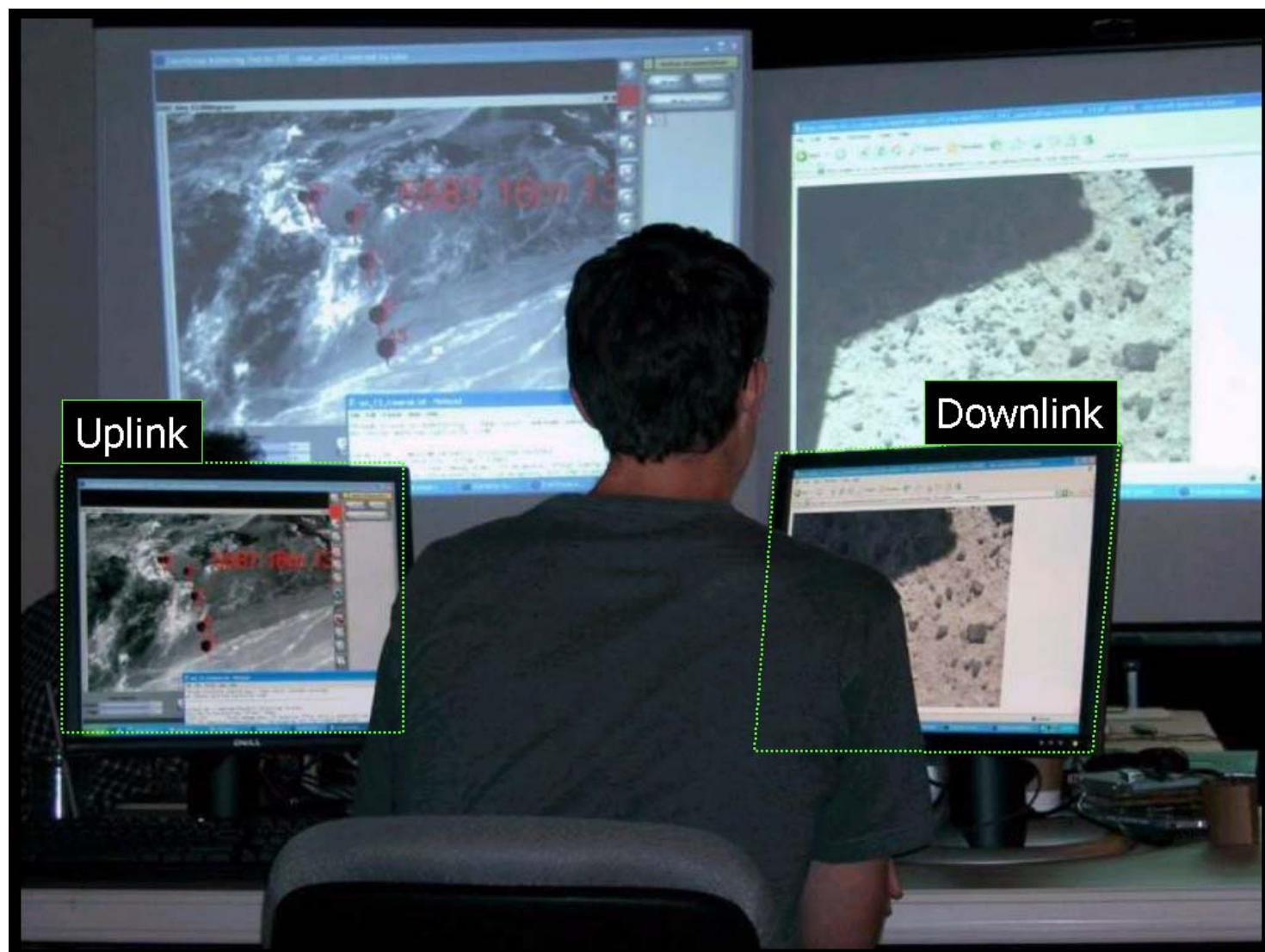
Operational concept:

- Conduct survey science over long traverse

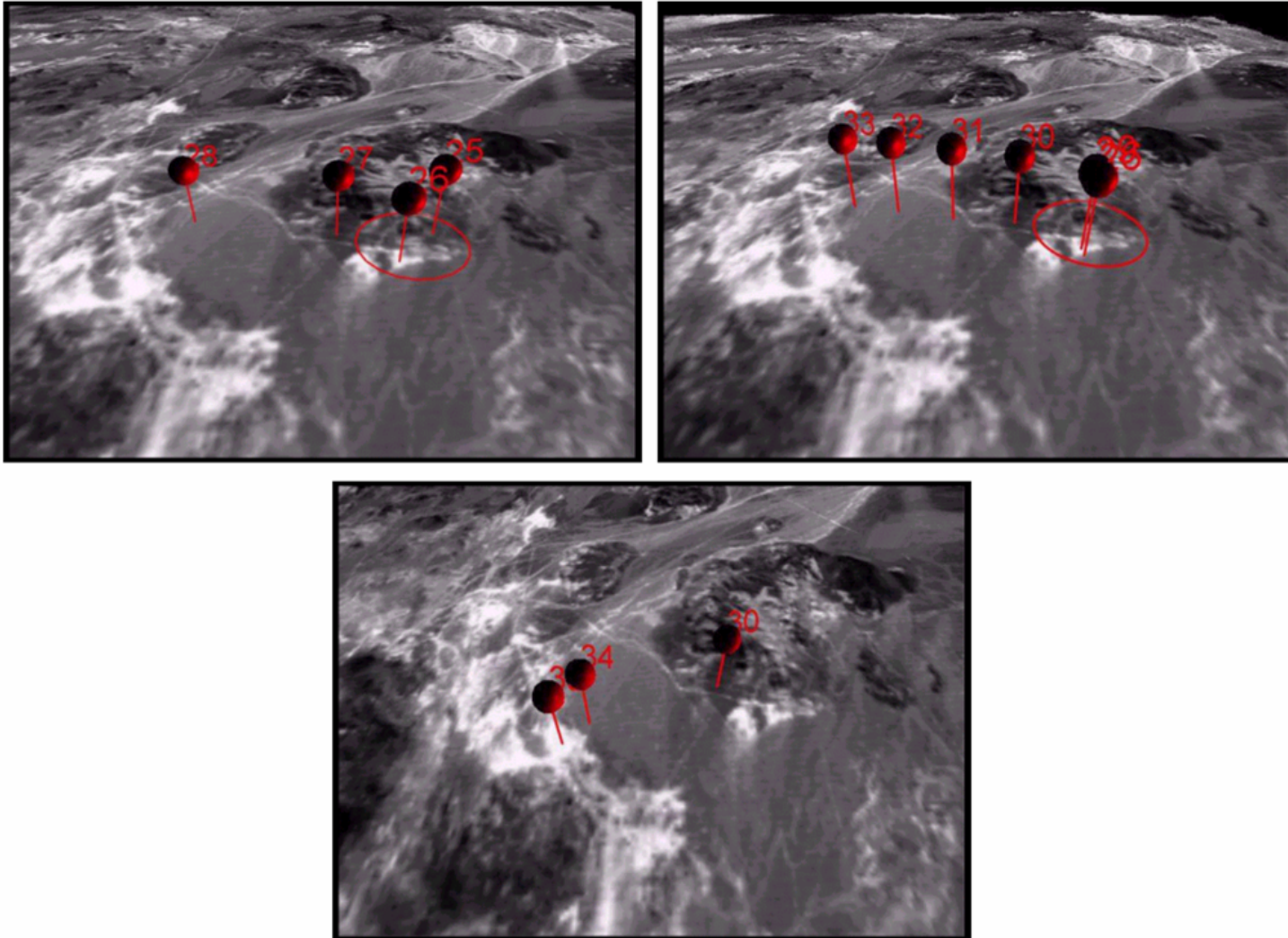
Some Implications:

- Time at any individual location limited
- Sampling will not be exhaustive
- Some things will be missed
- More things will be encountered

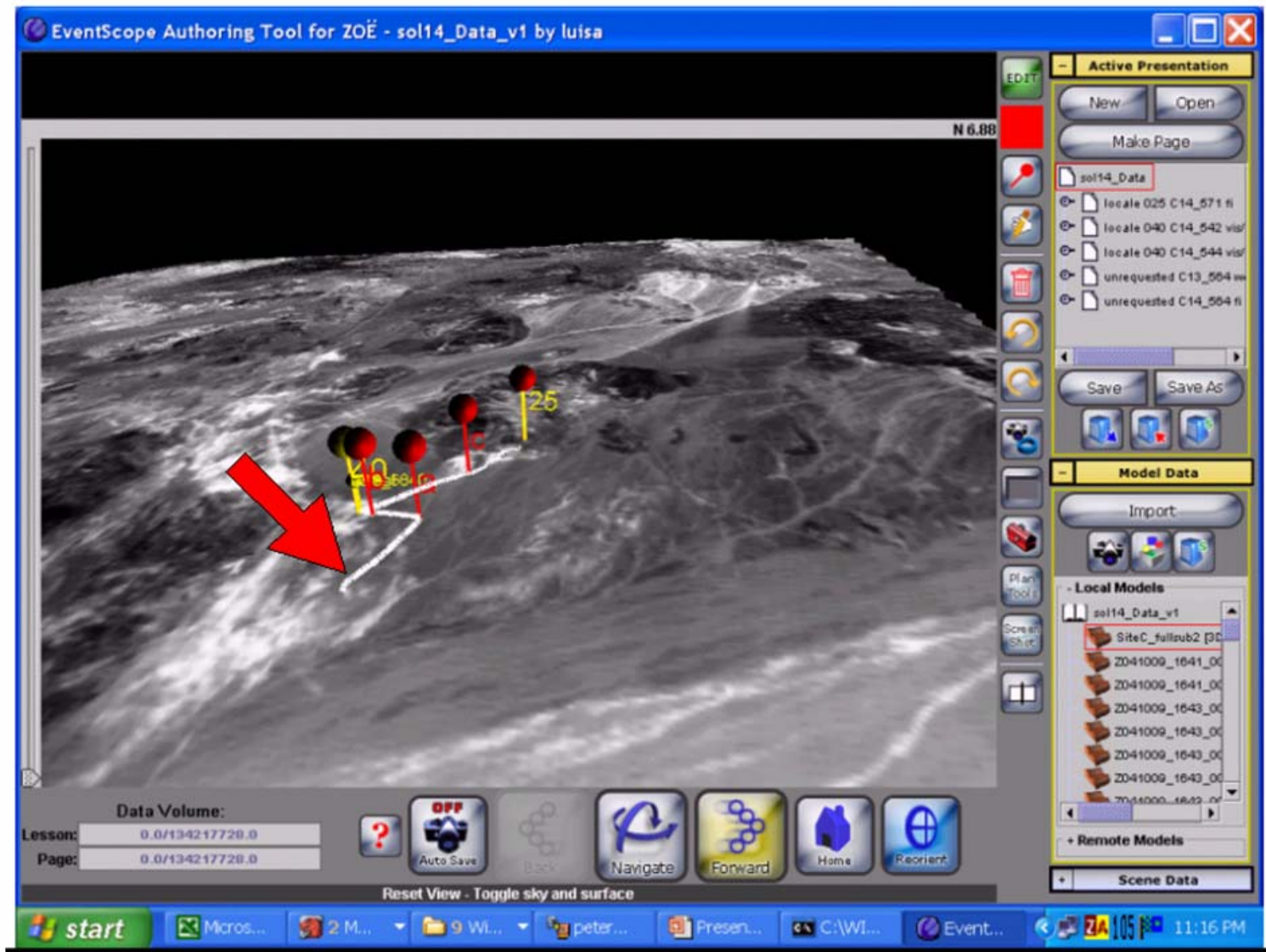
Science Operations



The EventScope Interface, Specifying Targets



EventScope: Reviewing Uploaded Plan



Our Role: Observe, Digest, Report

Transcripts:

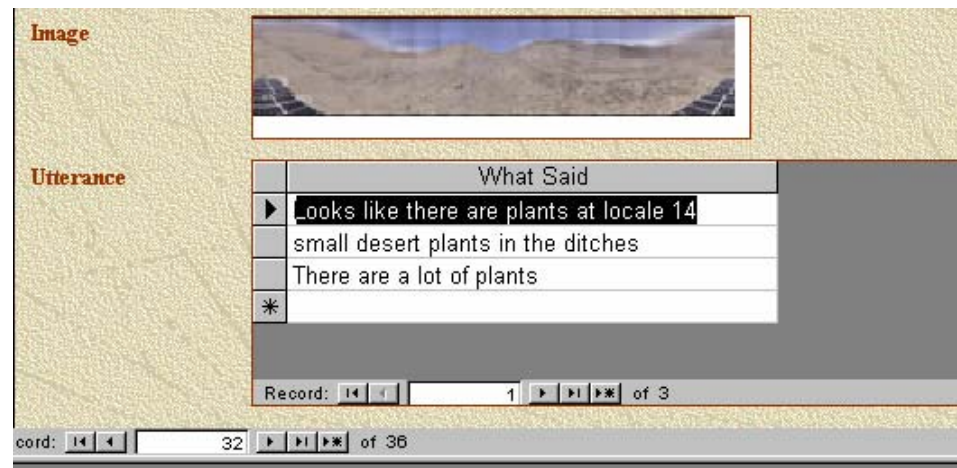
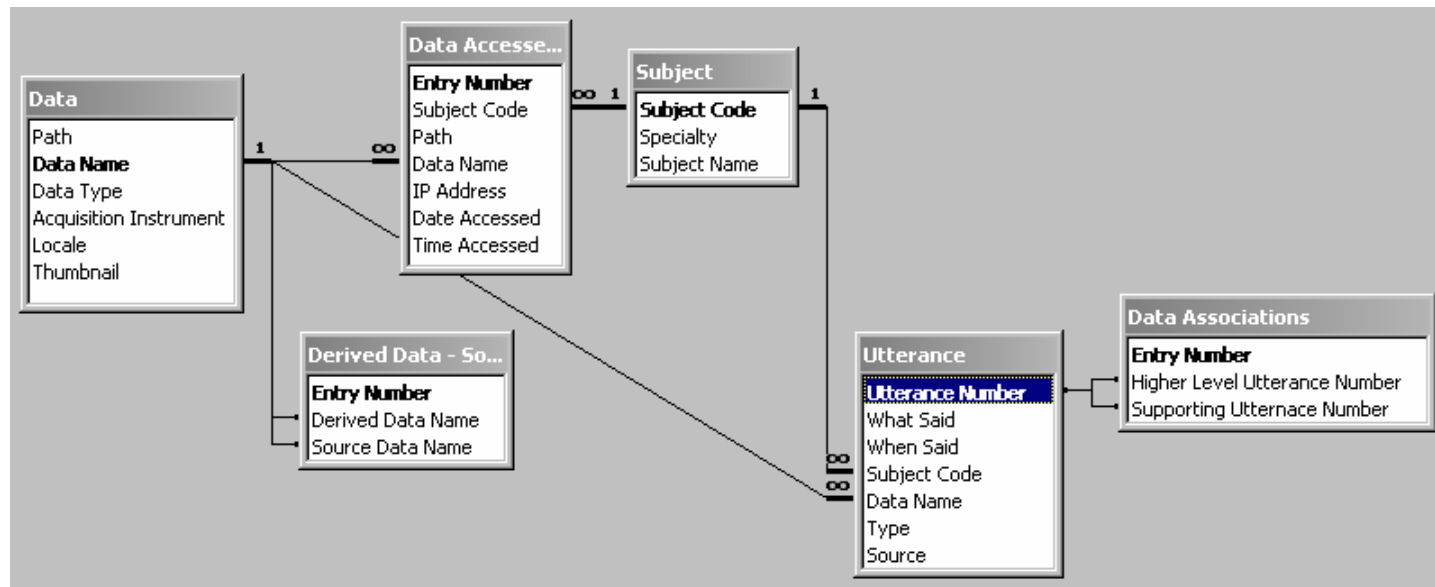
- 22,492 Lines of Transcript
 - 11,254 from Week 1
 - 11,238 from Week 2
- 61 Audio Tapes Used to Transcribe
 - 28 from Week 1
 - 33 from Week 2

Audio:

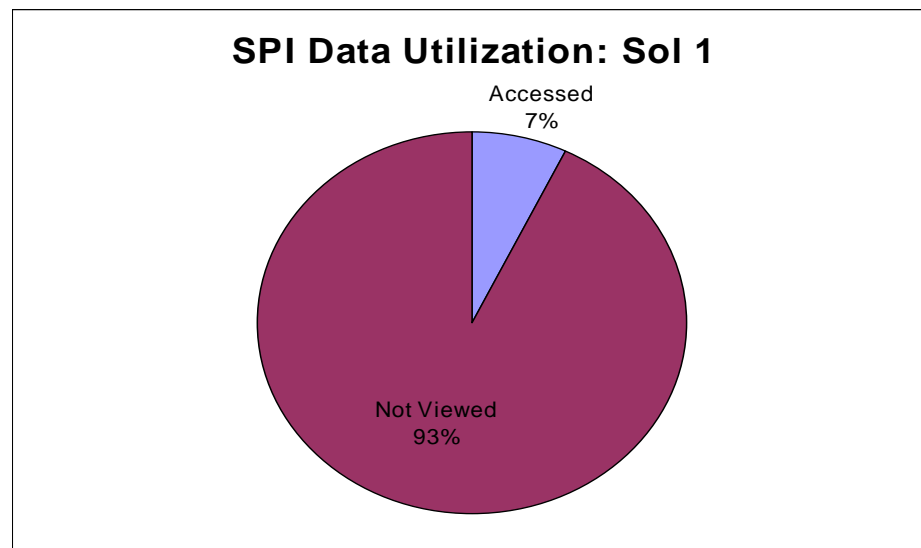
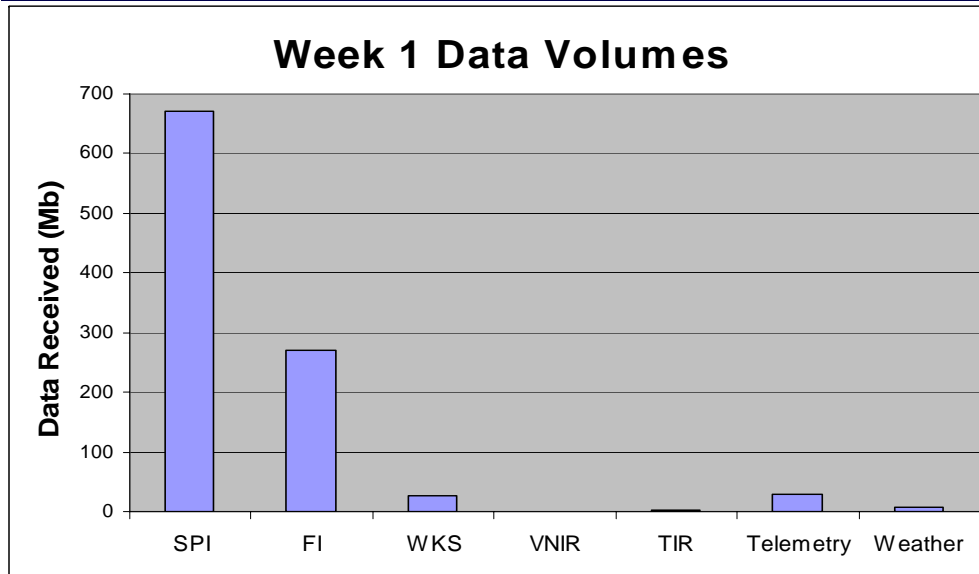
- 265 Audio Tapes Used
 - 148 from Week 1
 - 117 from Week 2
- ~ 3 Hours Per Tape
- 53 Tapes converted to MP3s

Time 1	Conversation 1
10/05/04 Team Tape 15:26	Female Voice: 15:25.
	Y: Okay. Let's get this meeting on the road.
	(irrelevant conversation)
	Y: While you're here and you guys are all here, just wanna note that I uploaded something new and now when you look at these support documents, in addition to the text file, there will also be image files, screen shots of the plan that we made, from the low and high angle, so you'll know what we are talking about when you look at this.
	R: ...
	Y: Right. Right. So when you look at this and are terribly confused about what all these really means. For instance, when you want to know where Locale 30 really was, you can go back and say, look at this, and you'll know ...
	R: That's what we think we did. The rover actually ...
	Y: So that's why this file is the traverse support documents. This is all our planning, so this isn't necessarily what

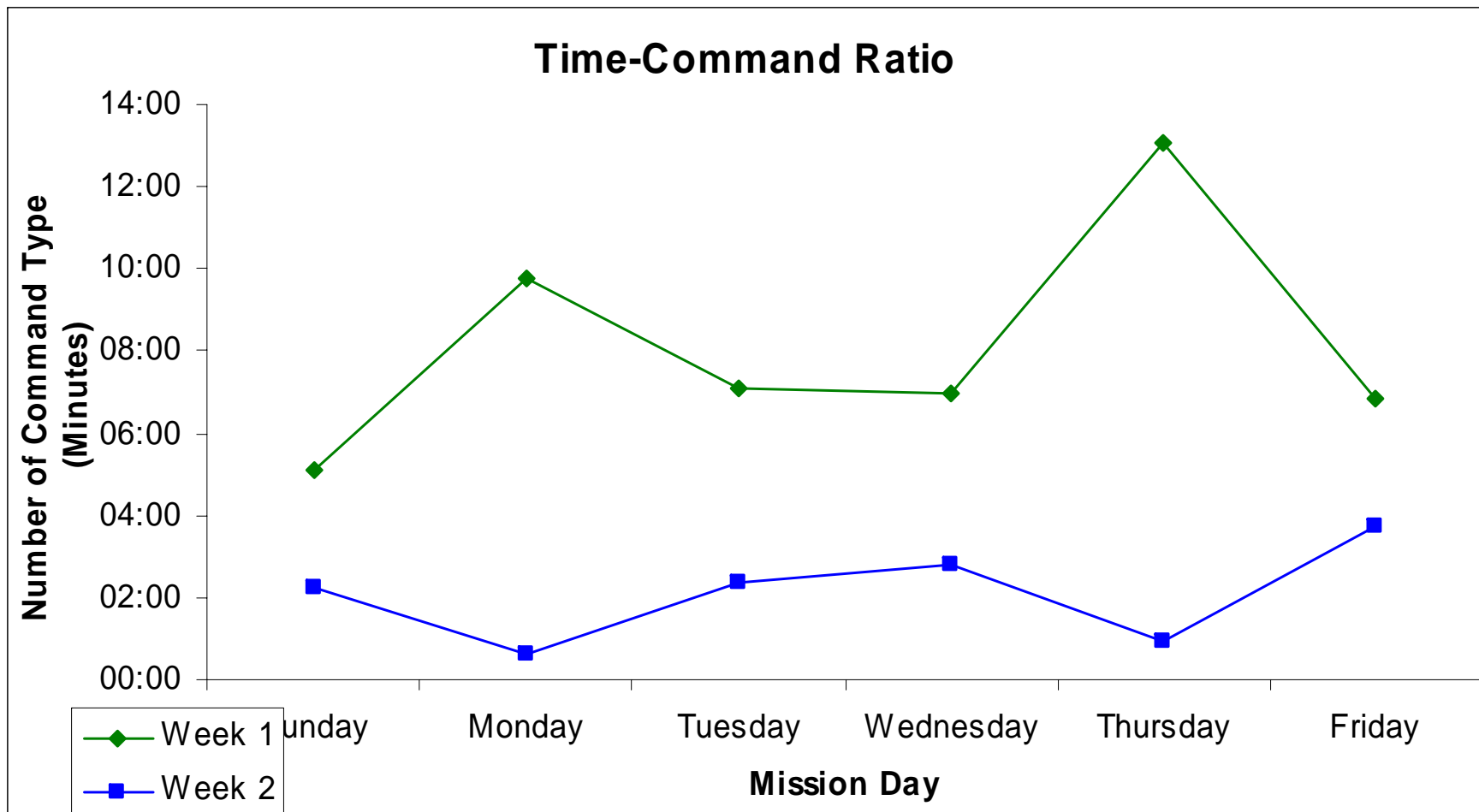
Organizing the Data - Database



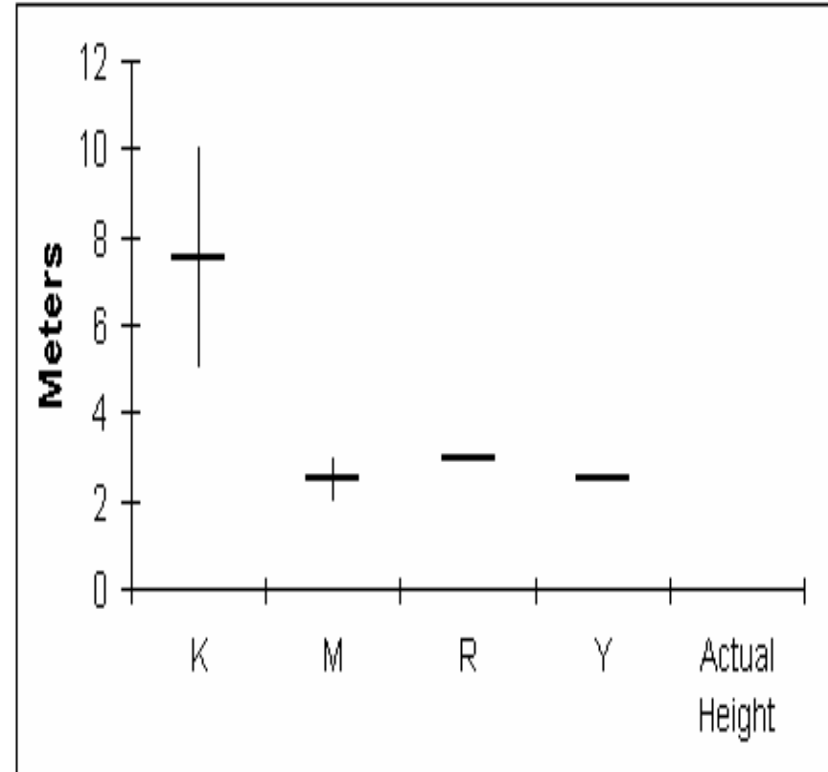
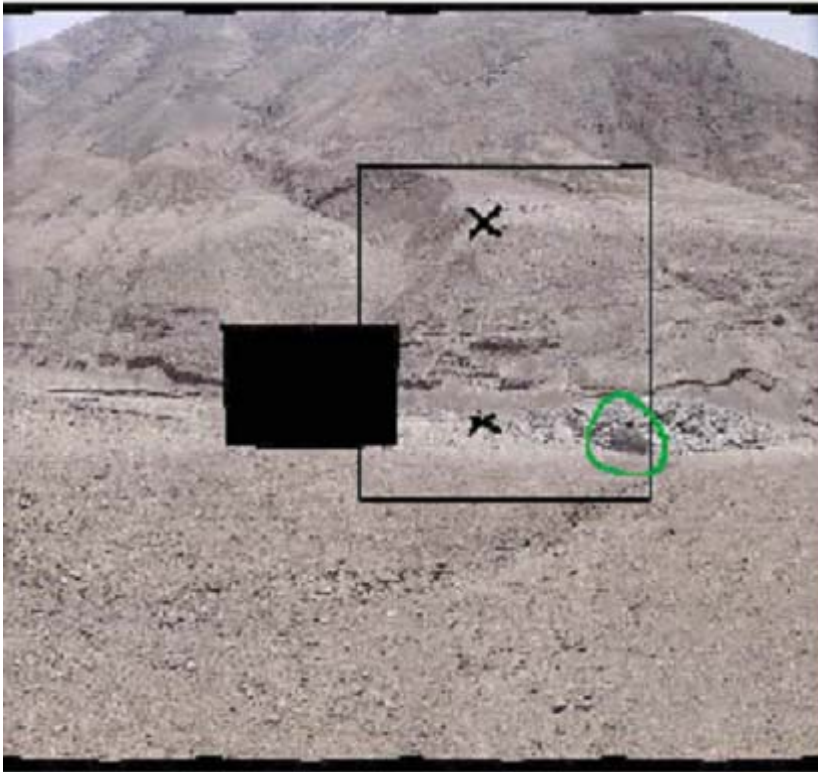
Data Returned



- **SPI Data accounted for 66% of data returns during week 1**
- **Only 7% of the High Resolution Sol 1 SPI Images were viewed**
- **Accounting for the $\frac{1}{4}$ resolution images, 46% of the returned data was never viewed.**



What is the vertical height between the two points of the outcrop?



Where the bottom point is the ground directly at the base of the outcrop, and the top point is the corner of the outcrop face.

M Hypothesis: (2-3 meters)



M: And it looks to me like that's pretty close to eye height, because I can see up above, I can see up above this scarp. This is a scarp; this is a mass deposit with layering on top of this. And here, this is a little above eye height.

R: 2 ½ meters

M: Yeah, I mean, actually it's a little above my eye height, probably. My eye height is about right there. We're a little above eye height. So I would say between 2 and 3 [meters].

R Hypothesis: (3 meters)



R: Now that looks like that a channel in there, so you are talking about this side...

B: The right side of the channel and where it drops off. So you might want to, for example, picture somebody standing there.

M: It's a little above eye height.

R: 2 1/2 meters I think.

M: Yeah.

R: I think it is about 1/2 meter from the bottom.

M: Well, actually, it's a little above my eye height.

K: You think it's only 2-1/2 meters? Wow...

M: Can you see the floor of the channel?

R: I think it is hidden by the lip.

R: I think we're about a half meter above the bottom of the drainage, which is why I get 2-1/2 for the top where we are sitting.

B: We're going from the bottom of the channel.

R: Are you going from the bottom? Okay then I go by 3 meters.

K Hypothesis: (5-10 meters)



M: It's a little above my eye height.

K: You think it's only 2-1/2 meters? Wow...I'm so off.

B: Well, what do you think?

K: No no, I'm not...I'm just not good because this perspective type of thing...I'm just really, really, really bad.

K: This will be the one where K will be batting zero, so don't everyone listen to K. You know.

R: Well, O, this will be the one weird that we will be 94 magnitude off. And you're the one going like guys that's like 20 feet height, NOOO.

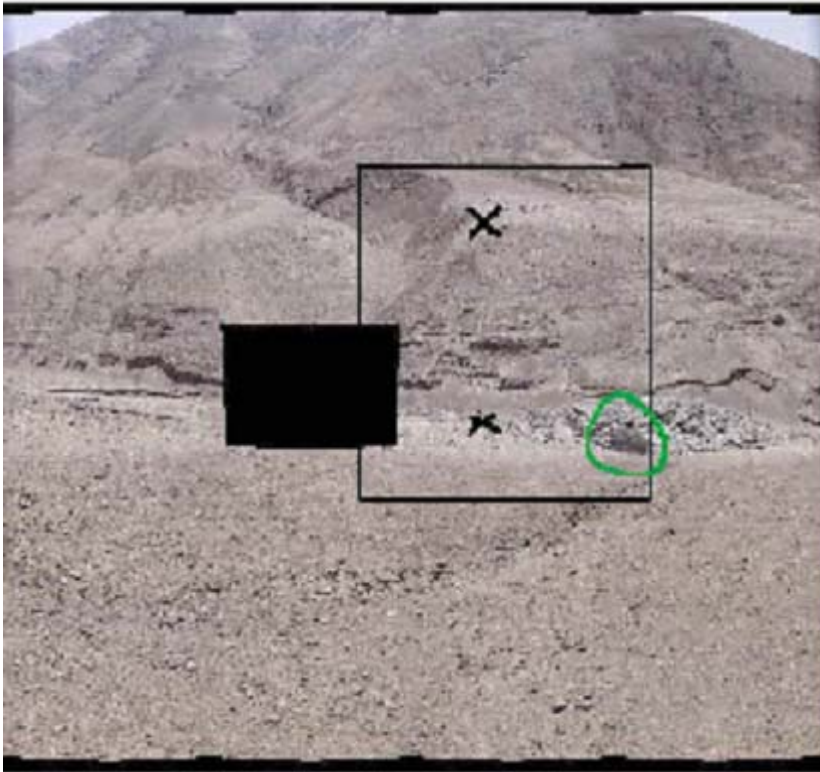
K: I think it's high.

K: And so that little area at the top is where you want, from the bottom of the channel up to that top point? So I'll go with, do you want me to give you a 5 to 10, or a 10?

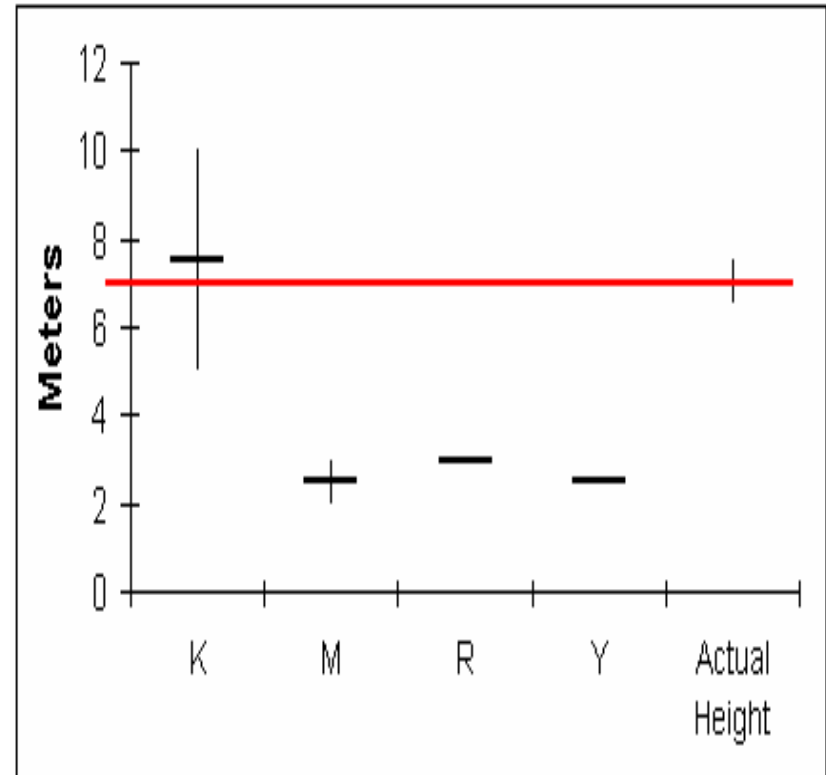
B: K, whatever you're comfortable with.

K: Five to 10 meters

Estimate of Height of Objects in the Field

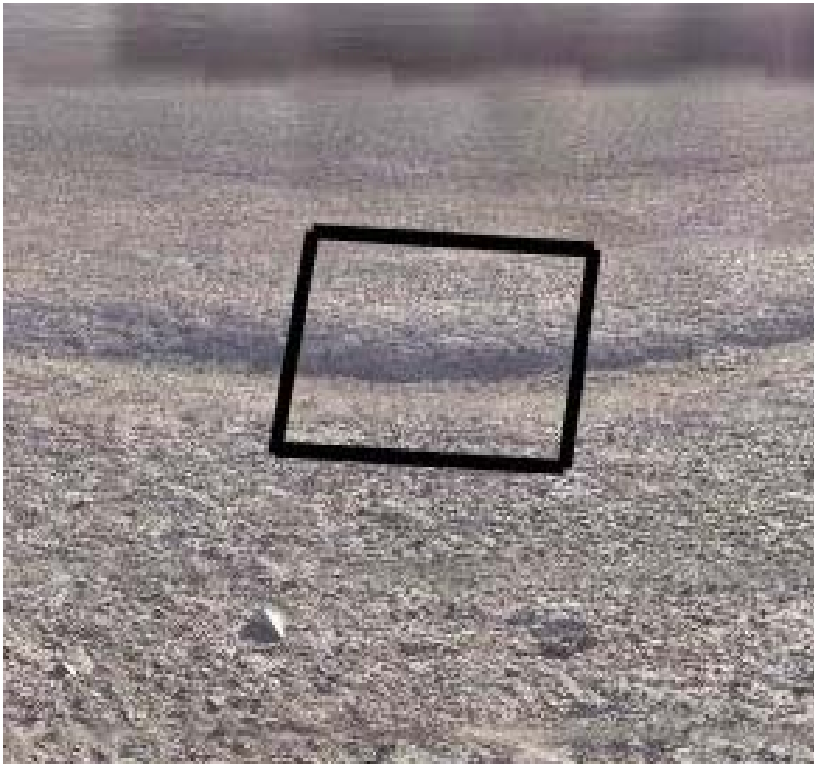


Where the bottom point is the ground directly at the base of the outcrop, and the top point is the corner of the outcrop face.

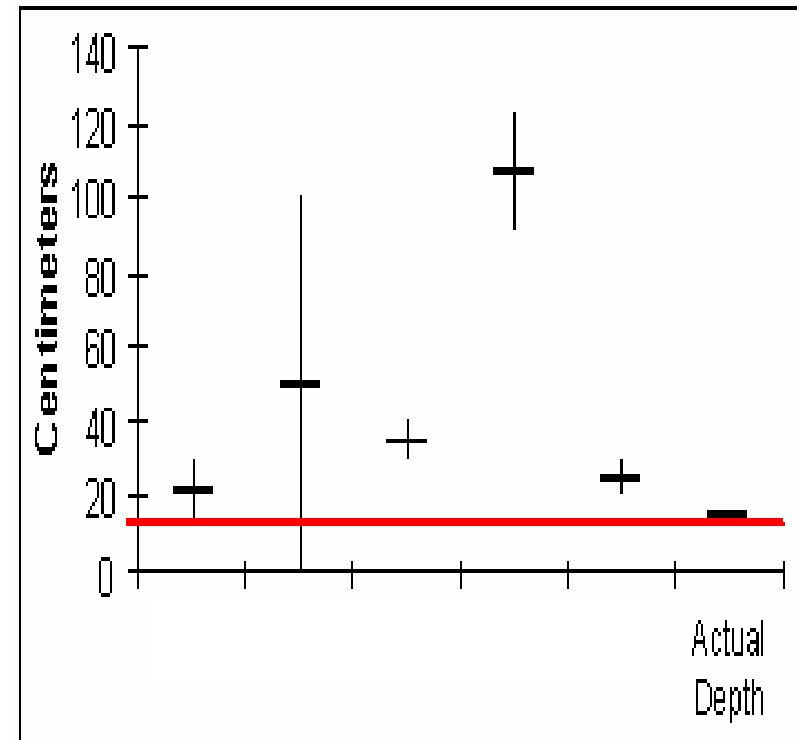


Actual Height is 7m +/- .5 m

What is the depth measurement of this channel?

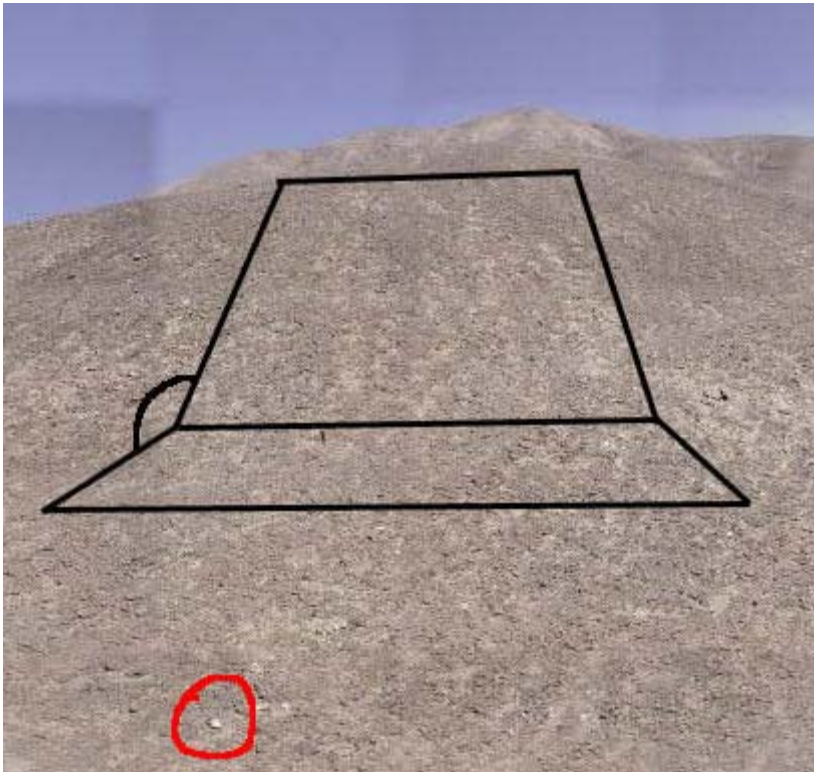


The depth measurement was obtained by measuring the distance from the bottom of the center of the channel up to the plane of the surrounding ground.

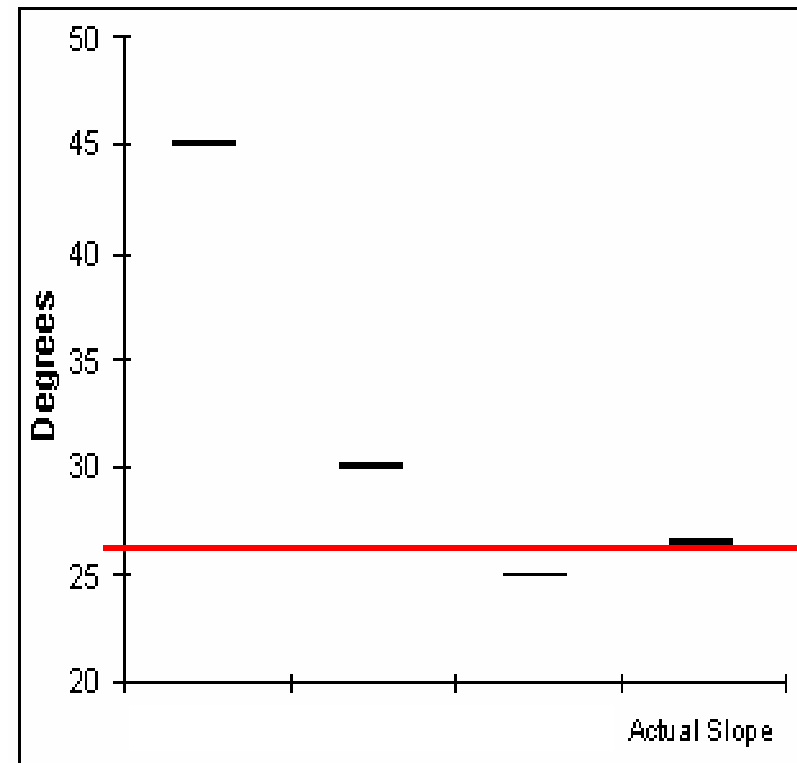


Actual Depth is 15 cm

What is the slope of the hill?



The slope was measured using a digital protractor.

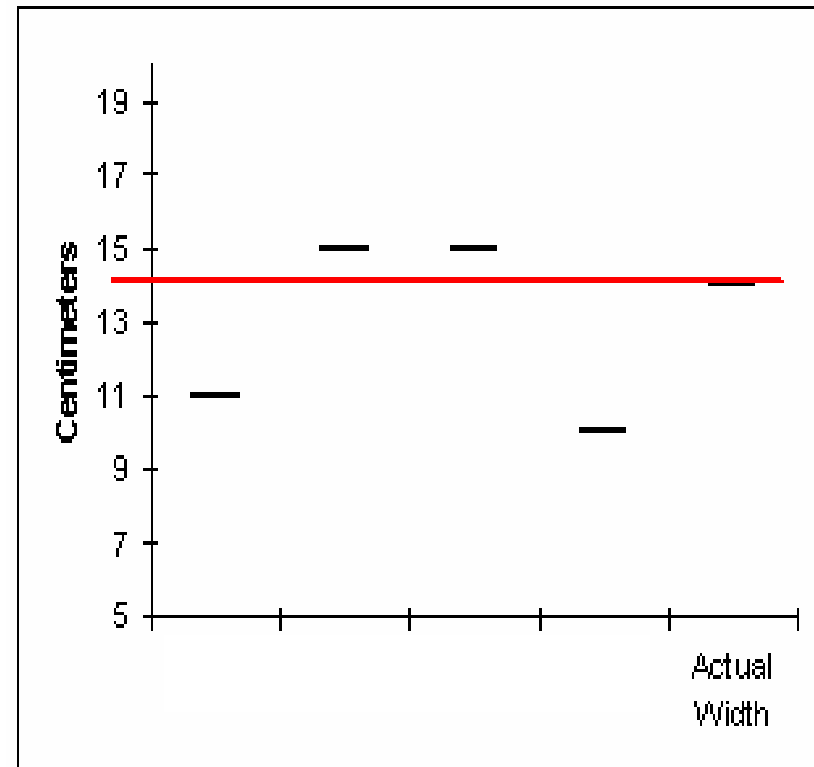


Actual Slope is 26.5 degrees

What is the width and depth of the trench that the science team has plowed?



Where the bottom point is the ground directly at the base of the outcrop, and the top point is the corner of the outcrop face.



Actual Width is 14 cm

Actual Depth is 0.5-2 cm

Y estimated depth was 1 in. (~2.54 cm)

N estimated depth was 2 cm

K estimated depth was 2 cm

R estimated depth was 1-2 cm

Analysis of Time on EventScope

Sol Number	Total Time on EventScope	Number of Commands in Rover Plan	Time to Command Ratio
1	2:08:19	25.00	0:05:08
2	3:35:18	22.00	0:09:47
3	3:03:56	26.00	0:07:04
4	3:29:42	30.00	0:06:59
5	4:08:46	19.00	0:13:06
6	2:24:00	21.00	0:06:51
7	1:35:15 ^a	0.00	N/A
Summation	18:50:01	143.00	0:48:56
Average	3:08:20	20.43	0:08:09
8	3:51:11	104.00	0:02:13
9	1:19:58	129.00	0:00:37
10	2:29:53	64.00	0:02:21
11	4:25:44	94.00	0:02:50
12	2:10:59	142.00	0:00:55
13	1:33:27	25.00	0:03:44
14	0:08:45 ^a	0.00	N/A
Summation	15:51:12	558.00	0:12:40
Average	2:38:32	79.71	0:02:07

Future Plans

- **Participate in 2005 Field Experiment**
- **Travel with scientists to Atacama to discover the differences between their findings with the rover and the findings in person**
- **Continue lab research based on findings from transcript analysis**
- **Work with interface developers to improve tools for the scientists**
- **Continue to extend our own tools and techniques**